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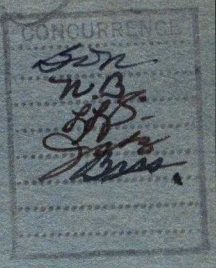


# REPORT

## of

# The Infantry Board

**No.** 1905

CARTRIDGE, API, CALIBER, .50, T49

**FORT BENNING, GEORGIA**

30 SEP 1945

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471 (C)(20 Apr 45) 4th Ind.
GNRQT-11/44982

HEADQUARTERS ARMY GROUND FORCES, Washington 25, D. C., 19 November 1945

TO: Commanding General, Army Service Forces. ATTENTION: Research and Development Division, Room 4E 633, The Pentagon

1. Herewith reports of test of Cartridge, Armor-Piercing-Incendiary, Caliber .50, T49, conducted by Army Ground Forces Board #3 (formerly the Infantry Board), and the former Tank Destroyer Board (now a section of Army Ground Forces Board #2).

2. The recommendations of the two cited boards are as follows:

a. Tank Destroyer Board (now a section of Army Ground Forces Board #2:)

(1) That the subject ammunition be considered superior to the standard Armor-Piercing-Incendiary, Caliber .50 Ammunition, M-8, as to accuracy and effectiveness against low grade gasoline, treated shrimp nets, and diesel fuel oil.

(2) That the subject ammunition be standardized upon proof by further tests that the barrel wear is not excessive.

b. Army Ground Forces Board #3 (formerly the Infantry Board):

(1) That the subject round be given no further consideration at this time for adoption for use by Army Ground Forces.

(2) That a high velocity APIT round similar to the Cartridge, Caliber .50, APIT M20 be developed and submitted for tests by Army Ground Forces Board #3, after it has been tested ballistically by the Ordnance Department in comparison with the Cartridge, Caliber .50, APIT M20.

3. As can be noted, the results of test and recommendations made by the two boards for the subject ammunition are at variance. However, due to the fact that the Army Ground Forces Board #3 considered the Cartridge, Caliber .50, APIT, M20, during the test, and this round has a direct effect on the desirability of the adoption of the Cartridge, API, Caliber .50, T49, the recommendations of Army Ground Forces Board #3, cited in paragraph 2b, above, are approved, and the recommendations of the Tank Destroyer Board (Now a section of Army Ground Forces Board #2), cited in paragraph 2a, above, are not approved.

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IB-471

Office of
THE INFANTRY BOARD

Fort Benning, Georgia
30 September 1945

SUBJECT: Cartridge, Armor-Piercing-Incendiary, Caliber .30, T49

THROUGH: The Commandant
The Infantry School
Fort Benning, Georgia

TO: The Commanding General
Army Ground Forces
Washington 25, D. C.

1. References.

a. Letter AGF to TIB file number 471 (C) GNRQT-11/23332, dated 20 April 1945.

b. Letter, Chief of Ordnance to AGF file, O.O. number 471.4/2548 (C) SPOTS, dated 31 March 1945.

c. TIB Report 1791, "Cartridge, Incendiary, Caliber .50, T58".

d. OCM Item 28041, "Cartridge, Armor-Piercing-Incendiary, Caliber .50, T49". Limited procurement recommended.

2. Authority and Purpose. Pursuant to instructions contained in letter AGF to TIB file No. 471 (C) GNRQT-11/23332, dated 20 April 1945, the subject cartridges were tested to determine whether they are sufficiently superior to the M8 API cartridges to warrant their adoption.

3. Description of Materiel.

a. The subject cartridge differs in outward appearance from other standard caliber .50 cartridges only in so far as the identifying colors (blue and silver) of the tip are concerned.

b. The API bullet used in the subject round is of the high velocity type which matches ballistically with that of the APIT cartridge T63. The weight of bullet is 500 grains as compared with the standard caliber .50 bullet weight of 650 grains.

4. Factual Background.

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a. The subject round is one of a "family" of high velocity caliber .50 cartridges developed by the Ordnance Department for use by the Army Air Forces to meet the following requirements:

(1) Reduced time of flight to aid in deflection shooting when fast flying (particularly German jet-propelled) planes are engaged.

(2) In incendiaries, a mixture sufficient in quantities and ignition effect for successful use against aircraft fuels with particular reference to Aviation Kerosene. (TIB Report 1791; OCM Item 28041)

b. The history of the development of high velocity caliber .50 incendiary cartridges is covered in considerable detail in TIB Report No. 1791 (reference, paragraph 1c). The following summary covers briefly further development steps as exemplified by the subject round (OCM Item 28041):

(1) It was developed as the armor-piercing companion round for the cartridge, incendiary, caliber .50, T48 (later standardized as M23) which had been found highly efficient for AAF use in proving ground and theatre service tests.

(2) Principal characteristics as determined by Ordnance tests:

| | |
|---|---|
| Bullet weight | 500 grains |
| Time of flight (600 yds) (forward fire at 300 mph from 36" barrel) | 0.69 seconds |
| Muzzle velocity | 3450 fps |
| Pressure (average max.) | 58000 psi |
| Accuracy (mean radius, 600 yds) | 6.16 inches |

(3) It complies with AAF requirements for an armor-piercing-incendiary round to match ballistically the T48 (M23) high velocity incendiary round.

(4) It is classified as

Required Type
Development Type
Limited Procurement Type

c. The "Family" of high velocity incendiary ammunition as finally constituted consisted of: (Reference, Appendix "B")



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(1) Cartridge, Incendiary, Cal. .50, T48

(2) Cartridge, Armor-Piercing-Incendiary, Cal. .50, T49 (subject ammunition)

(3) Cartridge, Armor-Piercing-Incendiary, Tracer T63

(4) Cartridge, Incendiary, Cal. .50, T58 (same as T48 with phosphorus substituted for incendiary mixture. Tests covered by TIB Report 1791 reference paragraph 1c)

d. Although reference paragraph 1b (Appendix "B") contains a statement that the Cartridge, Incendiary, Cal. .50, T48 was tested by Army Ground Forces and found to be unsatisfactory, there is no record of such tests in The Infantry Board files.

e. Concurrent development of caliber .50 ammunition for AGF use and the multiplicity of types available were resolved when on 29 January 1945 The Infantry Board in TIB Report No. 1603A recommended (1) standardization of cartridges APIT, Caliber .50, T28 (M20) as a 100% replacement for M1 Tracers and API (T16) M8; and, (2) pending availability of the APIT, a linking ratio of one APIT (M20) to three API (M8). As a result of the report and similar favorable reports from other service boards the APIT Cal. .50 T28 was standardized in March 1945 as APIT M20; but due to facilities available for production the basis of issue to AGF units was limited to one APIT (M20) to four API (M8). (OCM Item No. 27137)

5. Facts Shown by Tests.

a. The tips of subject cartridges are marked by identifying colors (blue and silver) to distinguish them from other caliber .50 rounds. There are no other differences in outward appearance from that of standard caliber .50 ammunition. (Test No. 1)

b. The subject ammunition was found by the tests to possess the following characteristics as compared with those of caliber .50 API Cartridges M8:

| | |
|---|---|
| Accuracy | Slightly inferior (Test No. 2) |
| Shattering effect | Slightly better (Test No. 3) |
| Penetration, short ranges | Slightly better (Tests Nos. 3 and 4) |
| Incendiary effect on oil, kerosene, Diesel fuel and gasoline | Equal (Test No. 5) |



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| | |
|---|---|
| Incendiary effect on fuels screened by armor plate | Equal (Test No. 6) |
| Incendiary effect on dry grass and wooden buildings | Superior (Test No. 7) |
| Effect on exposure to extreme temperatures | Equal (Test No. 8) |
| Flash on impact with target by day or night | Considerably greater (Test No. 9) |
| Adverse effect on functioning of machine gun | Equal (satisfactory) (Test No. 10) |

6. Discussion.

a. Although the subject cartridges are superior to standard cartridges, Incendiary Caliber .50, M8 in incendiary effect, only slightly inferior in accuracy and equal or slightly better in other features, their adoption for use by Infantry at this time is not warranted due to the ballistic differences between the two types. A high velocity incendiary round should be considered for adoption only after other standard caliber .50 rounds and particularly the APIT M20 have been redesigned for similar velocities and ballistic characteristics.

b. The Cartridge, Armor-Piercing-Incendiary-Tracer, Caliber .50, M20 (T28) which has been standardized as a replacement for both the Tracer M1 and the API M8 (used as a control in these tests) fulfills requirements for an all around caliber .50 cartridge for use by Ground Forces units. The cartridge API M8 matches ballistically with the APIT M20 and its retention as a standard item pending the manufacture of sufficient quantities of APIT M20 (or for reasons of economy) does not detract from the value of its use linked with APIT M20. On the other hand, although the results of linking, the subject cartridge with APIT M20 have not been established by tests, it can be assumed that linking any ballistically unbalanced rounds will result in reduced accuracy particularly at the longer ranges.

The advantages of the subject round which is not ballistically balanced with the APIT M20 are not believed to be sufficient to warrant its adoption as a companion round, particularly in view of the fact that the APIT M20 has been proven by previous tests to require no companion API round.

7. Conclusions. The Infantry Board concludes that:

a. There is no requirement in Army Ground Forces for an Armor-Piercing-Incendiary caliber .50 round of the M8 and T49 types which cannot be met by the Cartridge, caliber .50 M20.



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b. There is a requirement for a high velocity APIT round similar to the APIT M20, provided such a round does not lose too much in stability and performance to gain in velocity.

8. Recommendations. The Infantry Board recommends that:

a. The subject round be given no further consideration at this time for adoption for use by Army Ground Forces.

b. A high velocity APIT round similar to the Cartridge, Caliber .50, APIT M20 be developed and submitted for tests by AGF Board No. 3, after it has been tested ballistically by the Ordnance Department in comparison with the Cartridge, Caliber .50, APIT M20.

INGOMAR M. OSETH
Colonel, Infantry
President



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# RECORD of TEST

## ON

CARTRIDGE, ARMOR-PIERCING-INCENDIARY, CALIBER .50, T49

## TEST SECTION
## THE INFANTRY BOARD
### FORT BENNING, GEORGIA

**TO: THE DIRECTOR, THE INFANTRY BOARD.**
**HEREWITH DETAILED RECORD OF TESTS**
**RELATING TO THE ABOVE PROJECT.**

EDWARD B. CROSSMAN
Lt. Colonel, Infantry
TEST SECTION EXECUTIVE

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TEST SECTION
THE INFANTRY BOARD
FORT BENNING, GEORGIA

SUBJECT: RECORD OF TEST OF CARTRIDGE, ARMOR-PIERCING-INCENDIARY, CALIBER .50, T49.

TO: THE PRESIDENT, THE INFANTRY BOARD, FORT BENNING, GEORGIA

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I-N-D-E-X


| Paragraph No. | Subject | Page No. |
|---|---|---|
| 1 | AUTHORITY AND REFERENCES | 11 |
| 2 | INTRODUCTORY INFORMATION | 11 |
| 3 | PURPOSE OF TEST | 15 |
| 4 | DETAILS OF TESTS AND RESULTS | 16 |
| | Test No 1: Physical characteristics of the subject cartridge with Cartridge M8 API | 16 |
| | Test No. 2: Accuracy of subject cartridge as compared to Cartridge, M8, API | 17 |
| | Test No. 3: Shattering and penetrating effect of the subject cartridge on reinforced concrete as compared to Cartridge, M8, API | 19 |
| | Test No. 4: Penetrative effect of the subject cartridge on various thicknesses of armor plate as compared to Cartridge, M8, API | 21 |
| | Test No. 5: Incendiary effect of the subject cartridge on various fuels as compared to Cartridge M8, API | 22 |
| | Test No. 6: Incendiary effect of subject cartridge on various types of fuels, in 5 gallon containers, placed behind armor plate | 25 |
| | Test No. 7: Incendiary effect of subject cartridge on grass and wooden buildings as compared to Cartridge M8 API | 26 |
| | Test No. 8: Effect of exposure to extreme temperatures on subject cartridge as compared to Cartridge M8 API | 27 |
| | Test No. 9: Degree of explosive flash of the subject cartridge as compared to Cartridge M8 API in both daylight and night firing | 28 |
| | Test No. 10: Effect of subject cartridge on the functioning of Cal. .50 Machine Gun as compared to Cartridge M8 API | 29 |
| 5 | SUMMARY OF FACTS DETERMINED BY TESTS: | 30 |
| Appendix | | |
| "A" | Memorandum, The Infantry Board, MB-471, 5 May 1945 | 31 |
| "B" | Letter, Headquarters Army Ground Forces, GNROT-11/23332, 20 April 1945, with one indorsement | 33 |


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1. Authority and References.

a. Authority:

(1) Memorandum, The Infantry Board, IB-471, 5 May 1945. (Appendix "A")

(2) Letter, Headquarters Army Ground Forces, GNRQT-11/23332, 20 April 1945, with one indorsement. (Appendix "B")

b. References.

(1) Letter, Office of the Chief of Ordnance, O.O. No. 471.4/2548 (C), 31 March 1945.

(2) The Infantry Board Report of Test No. 1603-A "API Tracer, Caliber .50, T28"

(3) The Infantry Board Report of Test No. 1527 "Caliber .50 AP Incendiary Ammunition"

2. Introductory Information.

a. The subject cartridge is identical in external appearance with Cartridge M8 API except that it has a blue and silver tip on the bullet as compared to a plain silver tip for Cartridge M8 API.

b. The subject cartridge was developed for use by the Army Air Forces. By reducing the weight of the bullet in the subject cartridge to 500 gr. (see Test No. 1) as compared to the API M8 bullet weighing 650 gr., the initial muzzle velocity has been increased to approximately 3600 FPS. This compares to an initial muzzle velocity of approximately 3000 FPS for bullet API M8.

c. The subject bullet is matched ballistically with an APIT Cartridge M63 which is under development by the Ordnance Department.

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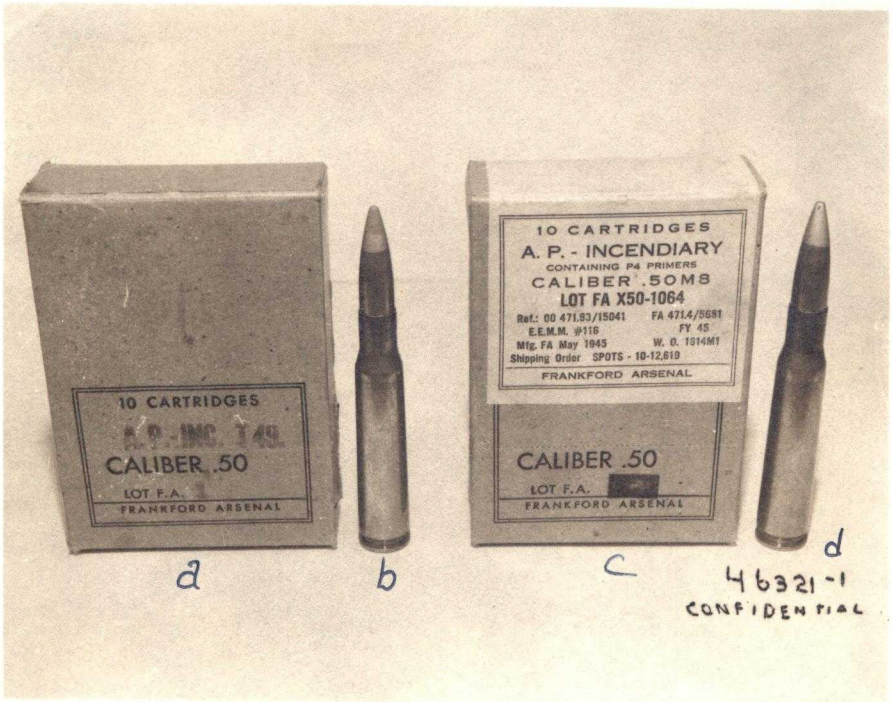


Subject Cartridge in 10 round package as compared to 10 round package of Cartridge M8. Single Cartridge also shown.

a. 10 round Carton subject Cartridge
b. Subject Cartridge
c. 10 round Carton Cartridge M8API

Figure 1



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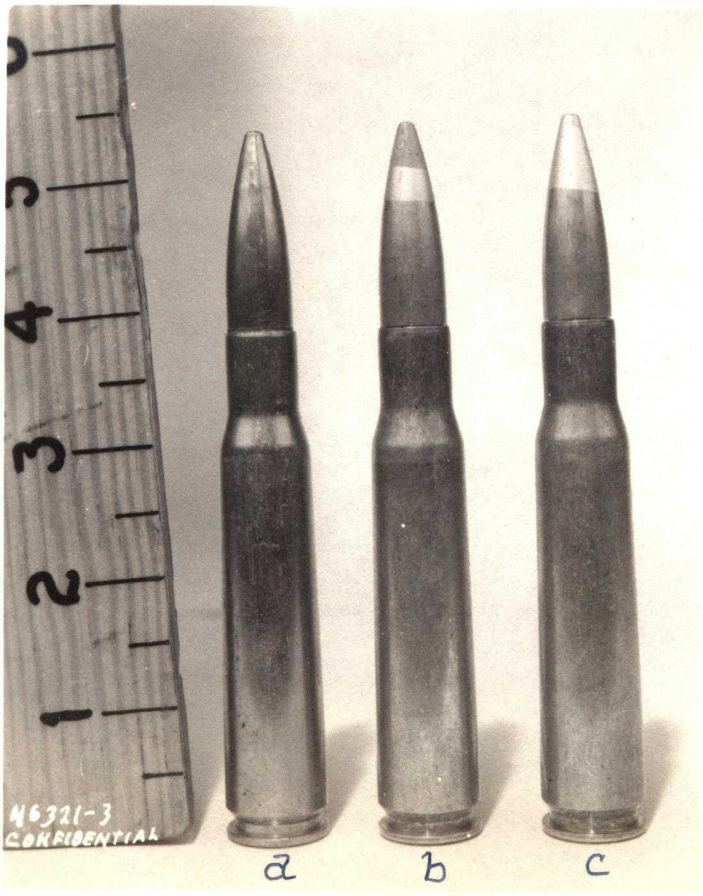


Subject Cartridge in comparison with Cartridge M8API and Cartridge M2 Ball.

a. M2 Ball
b. Subject Cartridge
c. M8API

Figure 2



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Bullets of Subject Cartridge in comparison with Bullets from Cartridge M8API and Cartridge M2 Ball.

a. T49 API Bullet
b. M8API Bullet
c. M2 Ball Bullet

Figure 3



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3. Purpose of Test.

To determine:

a. The physical characteristics of the subject cartridge.

b. The accuracy of subject cartridge as compared to Cartridge M8 API.

c. The shattering and penetrating effect of subject cartridge on reinforced concrete as compared to Cartridge M8 API.

d. The comparative incendiary effect of subject cartridge on various types of fuels in the open and behind armor plate as compared to Cartridge M8 API.

e. The incendiary effect of subject cartridge on grass and wooden buildings as compared to Cartridge M8 API.

f. The explosive flash of the subject cartridge in daylight and at night as compared to Cartridge M8 API.

g. The penetrative effect of subject cartridge on various thicknesses of armor plate as compared to Cartridge M8 API.

h. The functioning of subject cartridge after exposure to extreme temperatures as compared to Cartridge M8 API.

i. The effect of the subject cartridge on the functioning of the Cal. .50 Machine Gun as compared to Cartridge M8 API.

j. Other pertinent data.

4. Details of Tests and Results are as follows:

Test No. 1

a. Purpose: To determine the physical characteristics of the subject cartridge with Cartridge M8 API.

b. Method: By studying and weighing the subject cartridge as compared to Cartridge M8 API.

c. Results: (See Figures 1 through 3.)

(1) Subject cartridge is identical in external appearance to Cartridge M8 API with the exception that subject cartridge has a blue and silver tip as compared to a plain silver tip for Cartridge M8 API.

(2) For further comparative information, note the following tabulation:

| | M8 | T49 |
|---|---|---|
| Color of tip | Silver | Blue and silver |
| Length of bullet | 2.25 inches | 1.90 inches |
| Weight of bullet | .07 lbs. (500 gr.) | .09 Lbs. (650 gr. |
| Total weight of cartridge | .24 lbs. | .22 Lbs. |
| Composition of Case | Brass | Brass |



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Test No. 2

a. Purpose: To determine the accuracy of the subject cartridge as compared to Cartridge, M8, API.

b. Method: Tests were fired to obtain shot group and sight settings at 100, 300, 500, and 800 yards.

Two ten-shot groups were fired at each range with the subject cartridge and with Cartridge, M8, API. Firing was single shot. Shot groups were measured and tabulated.

c. Results:

(1) Results are recorded as follows:

| Range | Sight Setting | Ammunition | Shot Group Size (Inches) Vert. | Hor. | Max. | Location of Group Relat Point of Ai |
|---|---|---|---|---|---|---|
| 100 yds. | 1.5 left windage 600 yards | T49 | 5. | 8 | 8 | High 10 inc |
| | | | 6.5 | 8 | 9 | or 10 minut |
| | | Average Size: | 5.8 | 8 | 9 | |
| 100 yds. | 1.5 left windage 600 yards | M8 | 8 | 6 | 8.5 | " |
| | | | 7 | 5.5 | 7 | " |
| | | Average Size: | 8 | 5.8 | 7.8 | |
| 300 yds. | 1.5 left windage 600 yards | T49 | 29.5 | 25. | 32. | High 10 in |
| | | | 30. | 26. | 31. | or 3 minute |
| | | Average Size: | 29.8 | 25.5 | 31.5 | |
| 300 yds. | 1.5 left windage 600 yards | M8 | 19.5 | 14.5 | 19.5 | " |
| | | | 19.0 | 15.0 | 22.0 | |
| | | Average Size: | 19.2 | 14.7 | 20.7 | |
| 500 yds. | 1.5 left windage 650 yards | T49 | 45. | 15. | 45. | High 10 inc |
| | | | 23. | 31. | 33. | or 2 minute |
| | | Average Size: | 34. | 23. | 39. | |
| 500 yds. | 1.5 left windage 650 yards | M8 | 30.5 | 18.0 | 31.5 | " |
| | | | 40.0 | 23.5 | 40.5 | |
| | | Average Size: | 35.2 | 20.7 | 36. | |
| 8 800 yds. | 2.5* right windage 700 yards | T49 | 23 | 43 | 48 | High 10 inc |
| | | | 38 | 48 | 54 | or 1 minute |
| | | Average Size: | 30.5 | 45.5 | 51 | |
| 800 yds. | 2.5* right windage 700 yards | M8 | 47 | 26 | 47 | " |
| | | | 51 | 33 | 51 | |
| | | Average Size: | 49 | 29.5 | 49 | |

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*Firing at 800 yards range was done on the day following the firing at 100, 300, and 500 yards range.

(2). From the above tabulation, it appears that there is very little difference between the accuracy and center of impact with a given sight setting of the subject cartridge and Cartridge, M8 API, taking the results of all firing into consideration.

Test No. 3

a. Purpose: To determine the shattering and penetrating effect of the subject cartridge on reinforced concrete as compared to Cartridge, M8, API.

b. Method: Four pillboxes which were selected for this test were constructed to reinforced concrete with walls approximately 3.5 feet in thickness. Firing was done at 150 and 500 yards. Single shots were fired first with each type of ammunition to determine the penetrative effect of each type of ammunition. Finally, 40 rounds of each type of ammunition was fired to determine the shattering effect of each type of ammunition. Firing was directed against a different side of the pillboxes for each ammunition at each range.

c. Results:

(1) Penetration of concrete, as tabulated below.

| Ammunition | Range | Penetration of Each Round (Inches) |
|---|---|---|
| T49 | 150 yards | Round #1 - 4.5<br>#2 - 6.0<br>#3 - 9.5<br>#4 - 4.5<br>#5 - 7.5<br>#6 - 6.0<br>#7 - 5.5<br>#8 - 6.0 |
| | Average depth of penetration: | 6.2 inches |
| M8 | 150 yards | Round #1 - 4.5<br>#2 - 7.5<br>#3 - 6.0<br>#4 - 6.0<br>#5 - 6.5<br>#6 - 4.5<br>#7 - 4.<br>#8 - 5.5 |
| | Average depth of penetration: | 5.6 inches |

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| Ammunition | Range | Penetration of Each Round (Inches) |
|---|---|---|
| T49 | 500 yards | Round #1 - 6.5<br>#2 - 4.5<br>#3 - 5.<br>#4 - 4.5<br>#5 - 3.5<br>#6 - 4.<br>#7 - 5.<br>#8 - 6.5 |
| | Average depth of penetration | 4.9 inches |
| M8 | 500 yards | Round #1 - 5.5<br>#2 - 4.0<br>#3 - 5.0<br>#4 - 4.5<br>#5 - 6.0<br>#6 - 3.5<br>#7 - 4.5<br>#8 - 5.0 |
| | Average depth of penetration | 4.8 inches |

(2) Tabulation of shattering effect is as follows:

| Range | Ammunition | Rounds Fired | Size of Hole (Inches) | Depth of Hole (Inches) |
|---|---|---|---|---|
| 150 yards | T49 | 40 | 26 - 34 | 14.7 |
| 150 yards | M8 | 40 | 19 - 21 | 13.9 |
| 500 yards | T49 | 40 | 33 - 39 | 11.2 |
| 500 yards | M8 | 40 | 36 - 29 | 10.9 |

(3) From the above tabulation, it appears that the subject cartridge is slightly superior to Cartridge, M8, API, in shattering and penetrating effect on reinforced concrete.

Test No. 4

a. Purpose: To determine the penetrative effect of the subject cartridge on various thicknesses of armor plate as compared to Cartridge, M8, API.

b. Method: Firing was directed against one-inch face hardened armor plate at 100 yards; at one-inch face hardened armor plate at 500 yards; at one-half inch face hardened armor plate at 500 yards. All impact was at 90 degrees to face of armor plate.

c. Results: Results are as tabulated below:

| Range | Armor | No. of Rounds | Ammunition | Effect |
|---|---|---|---|---|
| 100 yds. | 1-inch face-hardened | 10 | T49 | None of the rounds penetr completely. Deepest pene tion was 7/8"; smallest p tration was 1/4". The tip one round penetrated the plate on one edge. |
| 100 yds. | 1-inch face-hardened | 10 | M8 | None of the rounds penetr Deepest penetration was 3 smallest penetration was |
| 500 yds. | 1-inch face-hardened | 10 | T49 | No rounds penetrated. De est penetration was 3/8". |
| 500 yds. | 1-inch face-hardened | 10 | M8 | No rounds penetrated. De est penetration was 1/4". |
| 500 yds. | 1/2-inch face-hardened | 10 | T49 | Six (6) rounds penetrated cleanly. Four (4) rounds did not penetrate; of the deepest penetration was 7 |
| 500 yds. | 1/2-inch face hardened | 10 | M8 | Five (5) rounds penetrate cleanly although one pene trated on one edge of the plate; 5 rds. failed to p trate. Deepest penetrati of these rounds was 3/4". |

(2) From the results above, it is indicated that the subject cartridge has slightly better penetrating qualities as compared to cartridge, M8, API, although the difference was most noticeable at the shorter ranges.

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Test No. 5

a. Purpose: To determine the incendiary effect of the subject cartridge on various fuels as compared to Cartridge M8, API.

b. Method: Test was conducted on the following types of fuels in 5 gallon container: Lubricating oil (SAE 30), kerosene, Diesel fuel, vehicular gasoline, 100 octane aviation gasoline. The firing was divided into three phases as follows:

(1) Phase I: Both types of ammunition were fired at above types of fuel ih 5 gallon containers. Fuel was at normal temperature. Range was 125 yards. The number of rounds necessary to ignite the various types of fuel was carefully recorded.

(2) Phase II: Both types of ammunition were fired at 5 gallon containers of the above types of fuel which had been subjected to a temperature of 120° F. for 24 hours. Range 100 yards. Number of rounds necessary to ignite fuels were recorded.

(3) Phase III: Both types of ammunition were fired at 5 gallon containers of the above types of fuel which had been subjected to a temperature of 10° F. for 48 hours. Range 125 yards. Number of rounds necessary to ignite fuels were recorded.

c. Results:

(1) Phase I (Containers at normal temperature):

| Fuel | Range (Yards) | Number of Hits to Ignite M8 | Number of Hits to Ignite T49 |
|---|---|---|---|
| Lubricating Oil | 125 | Ten rounds hit container and oil on the ground - no ignition observed. | 2nd and 3rd rounds hitting can flashed; no ignition in 10 rounds. |
| Kerosene | 125 | 3rd round fired fuel on ground. | 3rd round fired fuel on ground. |
| Diesel fuel | 125 | 3rd round striking can flashed. 6th round fired the fuel. | 4th and 5th round striking can flas 8th round fired t fuel. |



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| Fuel | Range (Yards) | Number of Hits to Ignite M8 | T49 |
|---|---|---|---|
| Vehicular Gasoline | 125 | 2nd round fired the fuel. | 1st round fired the fuel. |
| Aviation Gas | 125 | 2nd round fired the fuel. | 1st round fired the fuel in a tremendous puff of flame. |
| (2) Phase II (Containers exposed to temperature of 120° F. for 24 hours): | | | |
| Lubricating Oil | 100 | 10 rounds failed to ignite fuel | 10 rounds failed to to ignite fuel although several rounds flashed. |
| Kerosene | 100 | 3rd round ignited fuel. | 1st round fired fuel in big glash. |
| Diesel Oil | 100 | 4th round ignited fuel. | 1st round blew up can, 3rd round ignited fuel on ground. |
| Vehicular Gas | 100 | 1st round ignited fuel in large flash. | 2nd round ignited fuel. |
| Aviation Gas | 100 | 1st round blew up can; 3rd round ignited fuel on the ground. | 1st round upset can. 2nd round fired fuel. |
| (3) Phase III (Containers exposed to temperature of 10° F. for 48 hours): | | | |
| Lubricating Oil | 125 | 10 rounds failed to ignite. | 10 rounds failed to ignite. |
| Kerosene | 125 | 7th round ignited fuel on ground spilled from container. | 10 rounds failed to ignite fuel on ground. |
| Vehicular Gas | 125 | 3rd round fired fuel in big flash. | 2nd round blew up can, ignited fuel. |
| Diesel Fuel | 125 | 6th round ignited fuel. | 5th round ignited fuel. |
| Aviation Gas | 125 | 3rd round fired fuel on ground spilled from container. | 4th round fired fuel on ground. |

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(4) From the above tabulation it appeared that incendiary qualities of subject cartridge are approximately equal to Cartridge M8, API.

Test No. 6

a. Purpose: To determine the incendiary effect of subject cartridge on various types of fuels, in 5 gallon containers, placed behind armor plate.

b. Method: 5 gallon containers of lubricating oil (SAE 30), kerosene, Diesel fuel, vehicular gasoline, and aviation (100 octane) gasoline were placed behind a ½ inch thickness of face-hardened armor plate. Subject cartridge and Cartridge M8, API were fired at the fuel from a range of 125 yards through the armor plate. Containers were placed 1½ feet behind the armor plate. All firing was done at 90° impact to the armor plate.

c. Results:

(1) Results of firing at 5 gallon containers of the above 5 types of fuel placed behind ½ inch thickness of face-hardened armor plate is tabulated below:

| Fuel | Number of Hits to Ignite M8 | Number of Hits to Ignite T49 |
|---|---|---|
| Lubricating Oil | 5th and 6th rounds flashed up. No ignition in 10 rounds. | 4th and 6th rounds flashed. No ignition in 10 rounds. |
| Kerosene | 2nd round fired fuel. | 4th round fired fuel. |
| Diesel Fuel | 2nd round fired fuel. | 1st round fired fuel in big flash. |
| Vehicular Gas | 1st round exploded fuel in in big flame. | 1st round exploded fu and ignited. |
| Aviation Gas | 1st round exploded fuel and ignited. | 1st round exploded fu and ignited. |

(2) From above tabulation, incendiary qualities of subject cartridge were equal to Cartridge M8, API.



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Test No. 7

a. Purpose: To determine the incendiary effect of subject cartridge on grass and wooden buildings as compared to Cartridge M8 API.

b. Method:

(1) Both subject cartridge and Cartridge M8 API were fired at a wooden house from angle that would cause bullet to penetrate through the center of the house. The house had no insulation of any kind in the walls. The house was believed to be at least 20 years old. All wood interiors in the house were old and dried out. Range was 200 yards.

(2) Both subject cartridge and Cartridge M8 API were fired so as to detonate in high dry grass. Range was 250 yards. Ground on which bullet was detonated was hard packed and dry.

c. Results:

(1) 60 rounds of subject cartridge were fired into the wooden building in short 2-round bursts. The 26th round striking the building ignited some waste material between the walls of one room. Considerable smoke was observed. Fire burned itself out without damaging the house. Subsequent rounds failed to ignite building although a number of rounds scorched the wood interiors of the house.

(2) 60 rounds of Cartridge M8 API were fired into the building in short 2-round bursts. Several rounds scorched the wood interiors causing some smoke. However, no fires were ignited as a result of the 60 rounds detonated inside the building.

(3) 60 rounds of subject cartridge were fired into knee high dry grass at range of 250 yards. One small fire was started which quickly expired. No major ignition of grass was observed although the majority of rounds detonated on impact with hard ground.

(4) 60 rounds of Cartridge M8 API failed to ignite knee high dry grass in any way. Range of firing was 250 yards. Majority of rounds detonated on impact with hard ground.



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Test No. 8

8. Purpose: To determine the effect of exposure to extreme temperatures on subject cartridge as compared to Cartridge M8 API.

b. Method:

(1) One hundred rounds of both types of ammunition were exposed to a temperature of 120° for 48 hours. Ammunition was then removed and fired immediately.

(2) One hundred rounds of both types of ammunition were exposed to a temperature of -5° F. for a period of 48 hours. Ammunition was then removed and fired immediately.

(3) During firing of all ammunition attention was paid to functioning of machine gun, cyclic rate and action of ammunition on impact. Incendiary action was checked by firing ammunition exposed to high and low temperatures at 5 gallon containers of the following types of fuel: kerosene, Diesel fuel, and vehicular gasoline. Number of hits necessary to ignite fuels were recorded and compared to results obtained in Test No. 6.

c. Results:

(1) Functioning of machine gun:

(a) No malfunctioning of machine gun was observed as a result of exposure of either subject cartridge or Cartridge M8 API to extreme temperatures. No premature bursts were obtained, there was no excessive muzzle flash, and cyclic rate was not affected.

(2) Functioning on impact:

(a) There was no apparent malfunctioning of subject cartridge or Cartridge M8 API on impact as result of exposure to extreme temperatures.

(b) Results of test to check incendiary action of subject cartridge as compared to Cartridge M8 API as result of exposure to extreme temperatures is tabulated below:



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Ammunition exposed to 120°F. for 48 hours.

| Fuel | Range (Yards) | No. of hits to ignite M8 | T49 |
|---|---|---|---|
| Kerosene | 125 | 3rd round fired the fuel on ground | 5th round fired fuel spilled from container |
| Diesel Fuel | 125 | 1st round blew up can. 3rd round fired fuel on ground | 2nd round fired fuel in can and on ground |
| Gasoline (Vehicular) | 125 | 1st round upset can. 3rd fired fuel spilled on the ground | 1st round blew up can and exploded gasoline in big flash |

Ammunition exposed to 10°F. for 48 hours.

| | | | |
|---|---|---|---|
| Kerosene | 125 | 5th round fired the fuel | 4th round fired the fuel spilled on the ground |
| Diesel Fuel | 125 | 3rd round fired the fuel in the can | 2nd round fired the fuel on the can |
| Gasoline (Vehicular) | 125 | 2nd round fired the fuel | 2nd round fired the fuel in a big flash. |

(c) Results as tabulated above and compared to results obtained in Test No. 6 indicate that exposure to extreme temperatures had no apparent effect on either type of ammunition.

Test No. 9

a. Purpose: To determine the degree of explosive flash of the subject cartridge as compared to Cartridge M8 API in both daylight and night firing.

b. Method: Both subject cartridge and Cartridge M8 API were fired to detonate against steel plate at ranges of 100, 500 and 800 yards in both daylight and during darkness. Observers were placed approximately 400 yards on both flanks of the gun and the rear of the gun as well as within 100 yards of the point of impact.

c. Results: Subject cartridge produced a considerably brighter flash on impact than was produced by Cartridge M8 API. The larger flash was particularly noticeable during darkness. Flash of subject cartridge under darkness appeared to be almost twice as bright as Cartridge M8 API. Also in both daylight and during darkness a larger amount of smoke was emitted from subject cartridge than resulted from impact of Cartridge M8 API. The greater flash produced by subject cartridge was apparent at all ranges tested.



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Test No. 10

a. Purpose: To determine the effect of subject cartridge on the functioning of Cal. .50 Machine Gun as compared to Cartridge M8 API.

b. Method: During all firing conducted with subject cartridge close observation was maintained on the functioning of the gun as compared to Cartridge M8 API. Cyclic rates were checked and stoppages recorded.

c. Results: Functioning of the subject cartridge appeared equal in every way to functioning of Cartridge M8 API. No unusual stoppages were noticed and the cyclic rate was approximately the same. Stability of gun in firing was the same with both types of ammunition.



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5. Summary of Facts Determined by Tests:

a. Subject cartridge is identified by blue and silver tip. No other external appearances differ from Cartridge M8 API. Weight of bullet in subject cartridge is considerably less than the bullet in Cartridge M8 API. (Test No. 1)

b. Accuracy of subject cartridge was approximately the same as obtained by Cartridge M8 API. (Test No. 2)

c. Shattering and penetrating effect of subject cartridge was slightly better than obtained by Cartridge M8 API. (Test No. 3)

d. Penetrative effect of subject cartridge on armor plate was slightly better at short ranges than was obtained by Cartridge M8 API. This difference, however, was very small. (Test No. 4)

e. Incendiary effect of subject cartridge on lubricating oil, kerosene, Diesel fuel, gasoline (both vehicular and aviation grade) was equal to Cartridge M8 API. (Test No. 5)

f. Incendiary effect of subject cartridge on fuels placed behind armor plate was equal to effect produced by Cartridge M8 API. (Test No. 6)

g. Incendiary effect of subject cartridge on dry grass and wooden buildings was slightly superior to Cartridge M8 API. (Test No. 7)

h. Exposure to extreme temperatures did not affect functioning of subject cartridge as compared to Cartridge M8 API. (Test No. 8)

i. Explosive flash on impact was considerably greater with subject cartridge during day and night firing than it was with Cartridge M8 API. (Test No. 9)

j. Subject cartridge had no adverse effect on functioning of the machine gun as compared to Cartridge M8 API. (Test No. 10)

NORTHAM WARREN
Major, Field Artillery
Test Officer

I concur in the above Record of Test

EDWARD B. CROSSMAN
Lt. Colonel, Infantry
Test Section Executive